Arizona Hantavirus Update

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Arizona Department of Health Services

Rodent-borne Viruses of Arizona

- Hantaviruses:
  - Sin Nombre
  - Limestone Canyon
  - El Moro Canyon
- Arenaviruses:
  - Lymphocytic Choriomeningitis Virus
  - Whitewater Arroyo Virus

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Characteristics of Hantaviruses

- Rodent hosts

  Genus and possibly species specific

- Transmission:

  -Biting, communal behavior

  -Aerosolization of virus from rodent excreta

  -Some human-to-human (Andes Virus only)

- Primarily Old World Disease until 1993 Four-Corners outbreak

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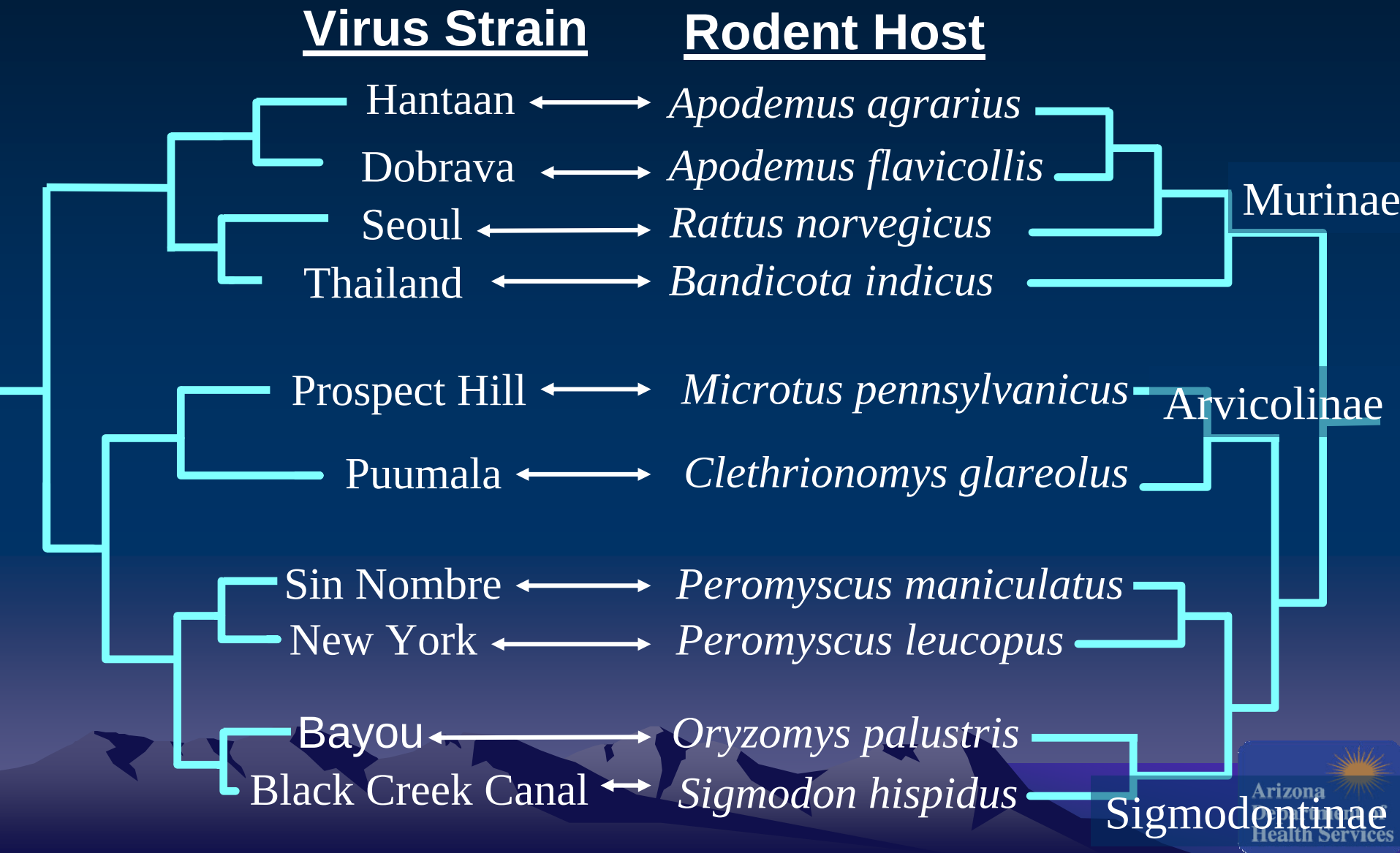
Rodent Associations with Hantavirus

- Solely rodent reservoirs (except for one insectivore)
- Typically 1 virus → to one host
- Chronic asymptomatic infections
- Long-term shedding of virus
- Present in 3 subfamilies of murid rodents

Virus is Rodent-specific



New World Hantaviruses

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Update

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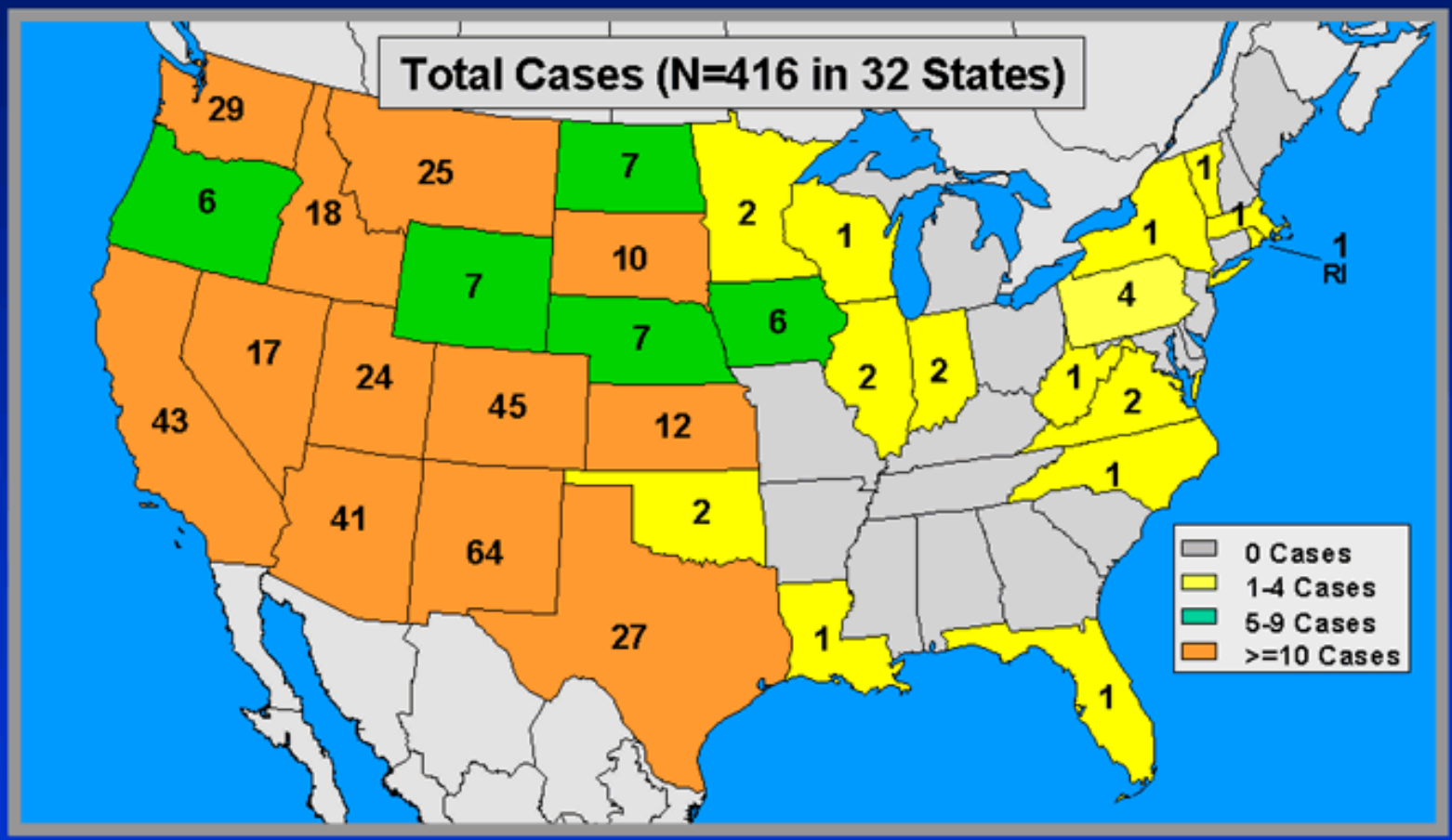
Hantavirus Pulmonary Syndrome Cases by State of Residence United States – February 1, 2006



Five cases were reported with either unknown state of residence or were not residents of the United States.

CDC

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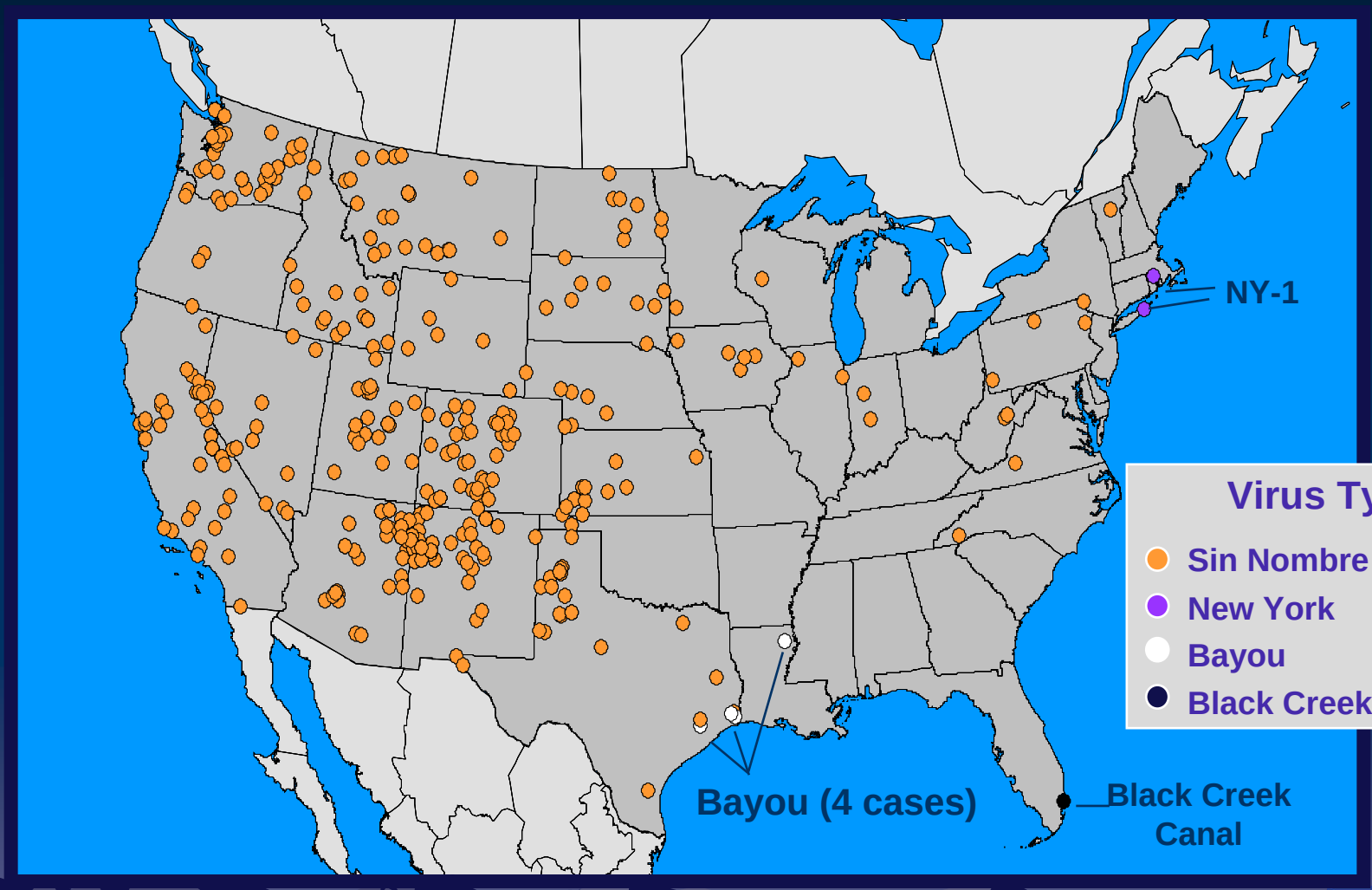
Location of HPS Cases by Virus Type as of February 1, 2006

Total Cases (N = 416 in 30 States)



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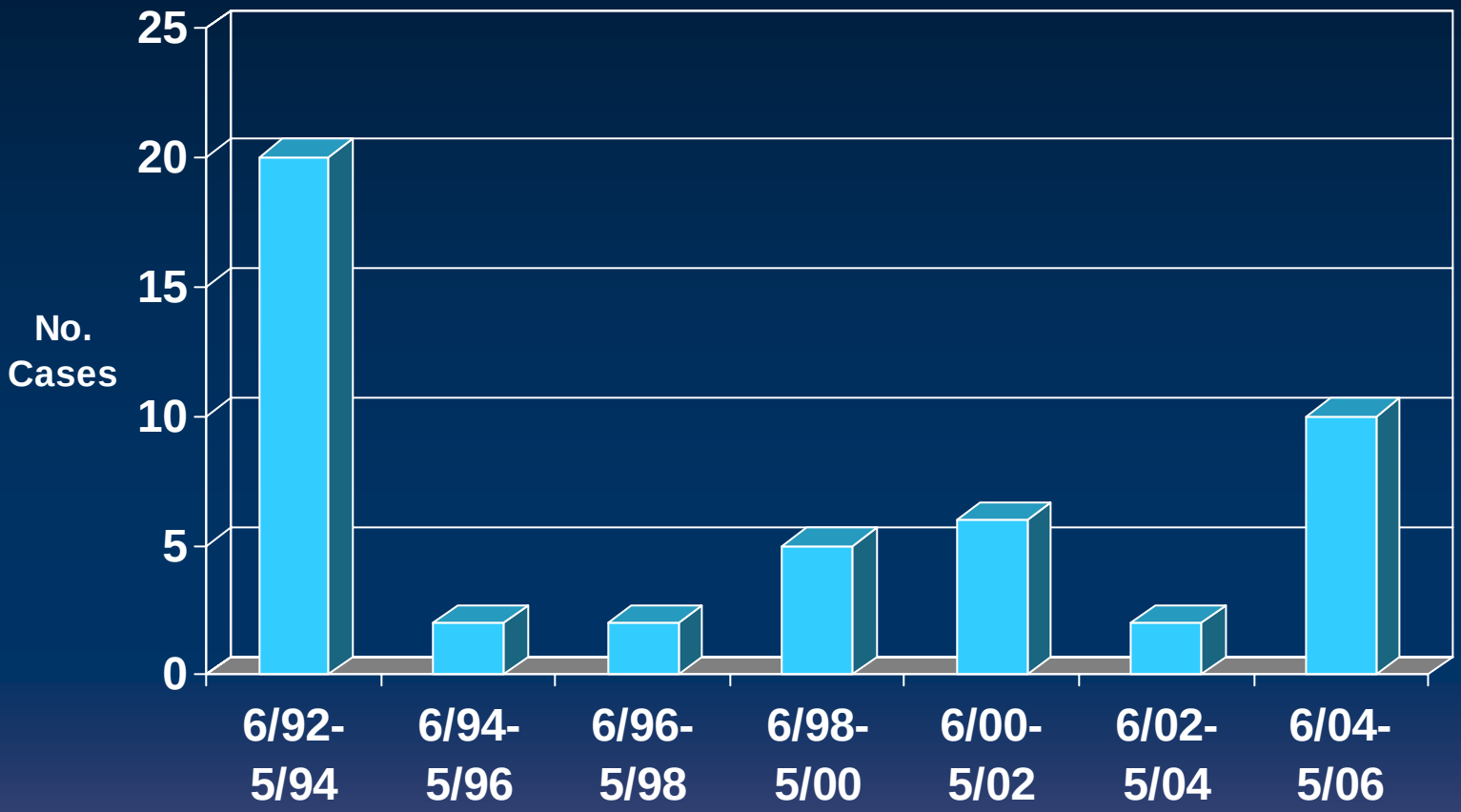
Hantavirus Pulmonary Syndrome, United States Descriptive Demographic Statistics, February 1, 2006

Characteristics		Total	AZ
	N	416 (100%)	47 (11%)
Gender			
	Male	260 (63%)	25 (53%)
	Female	156 (37%)	22 (47%)
Race			
	White	320 (77%)	19 (40%)
	American Indian	79 (19%)	26 (55%)
	Black	6 (2%)	--
	Asian	3 (1%)	--
Ethnicity			
	Hispanic	55 (13%)	2 (4%)
Case Fatality			
	Dead	146 (35%)	15 (32%)
Age (years)		Mean = 38 [10 – 83]	Mean = 39 [11 – 71]

Arizona HPS Cases, 1992-2006



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Why?

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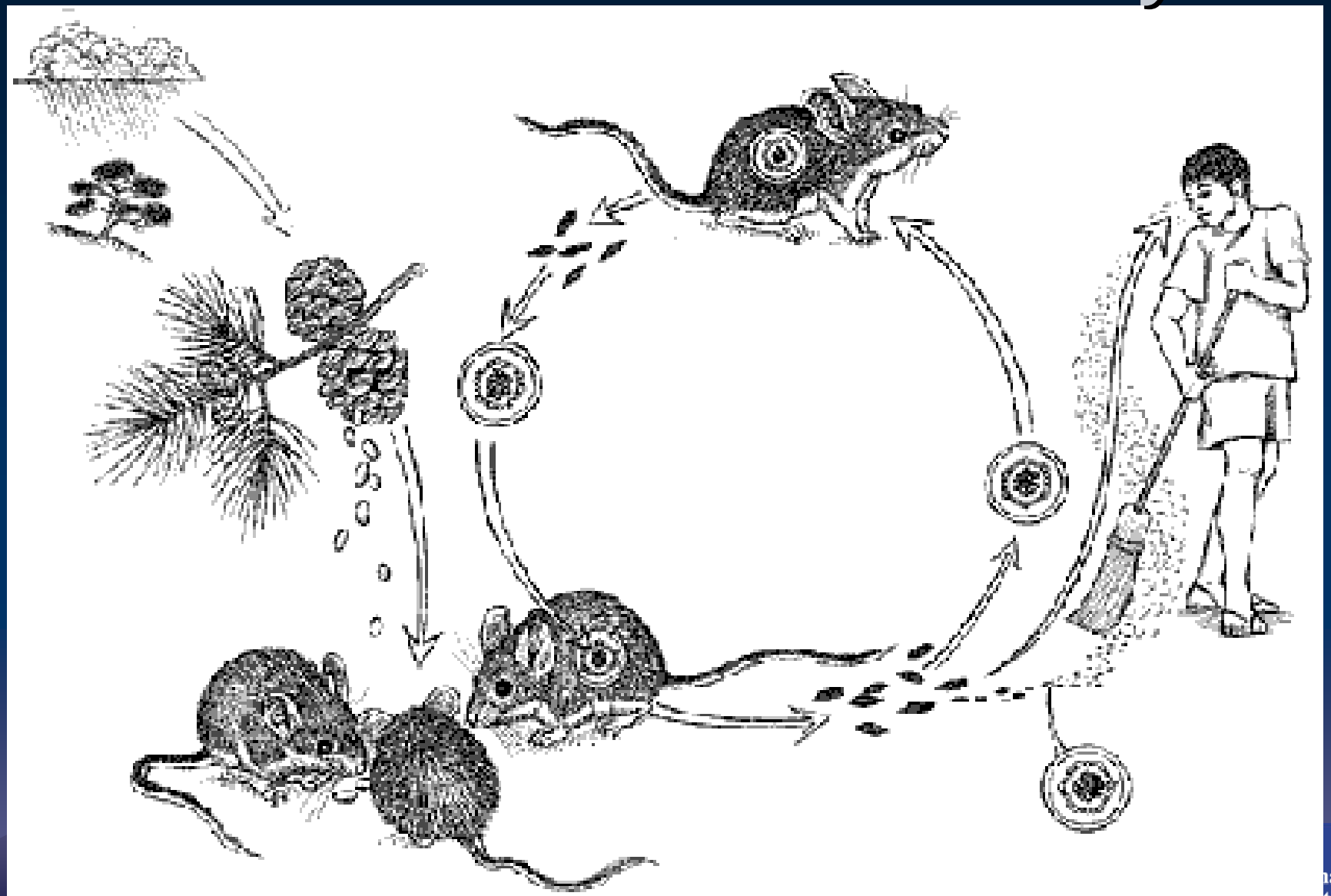
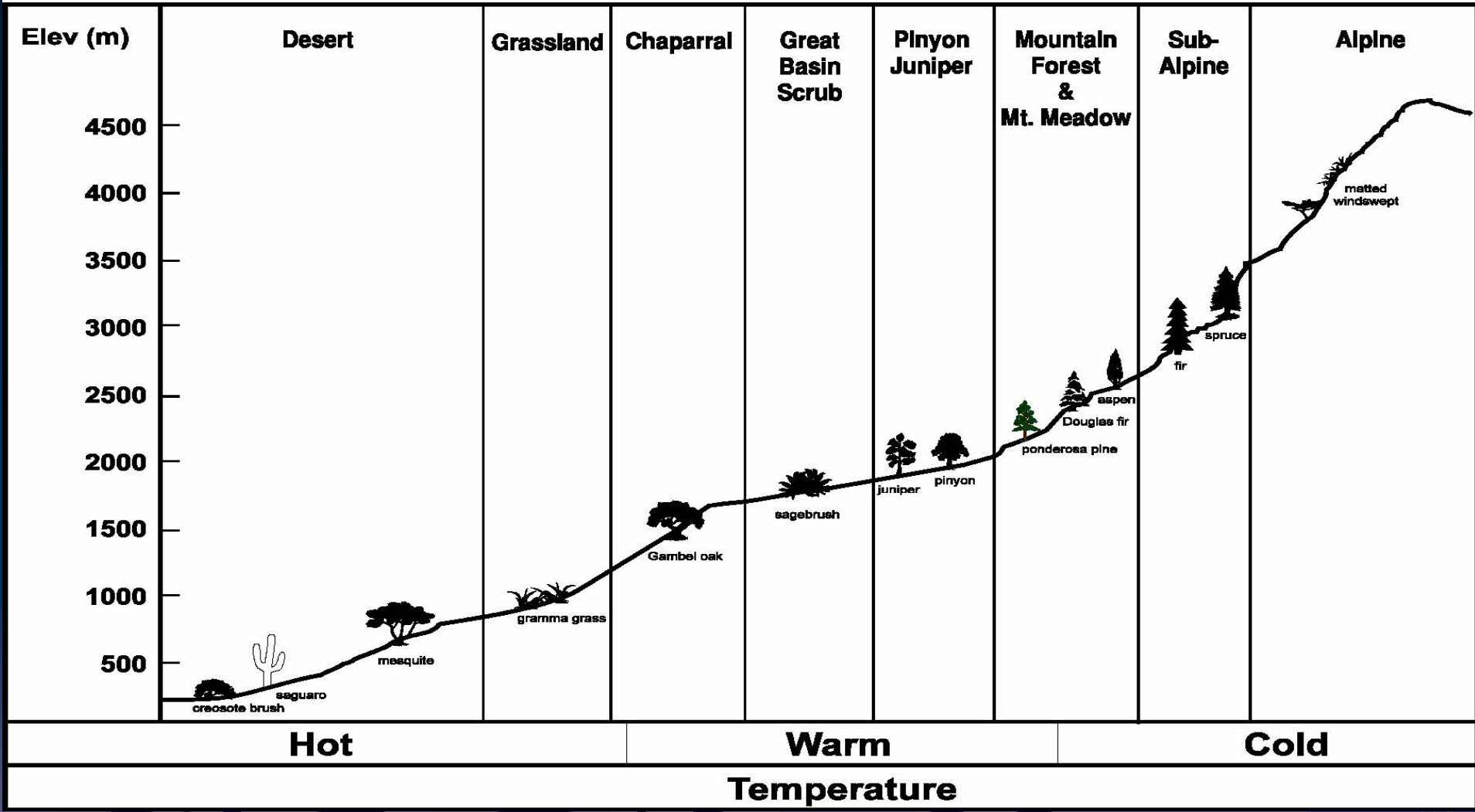
The Hantavirus Infection Cycle



Environmental and Climatic Factors Associated with Cases

- Strong seasonality
- Different biomes have different seasonality
- Infection rates fluctuate with climate and population size
- Outbreaks tied to heavy rainfall and subsequent drought

Idealized Profile of Biomes Sampled Southwestern United States



Mills, et al, 1997, Am J Trop Med Hyg

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DECREASE IN SEROPREVALENCE OF ANTIBODIES TO HANTAVIRUS IN RODENTS FROM 1993–1994 HANTAVIRUS PULMONARY SYNDROME CASE SITES

Engelthaler, Levy, Fink, et al,
1998, Am J Trop Med Hyg

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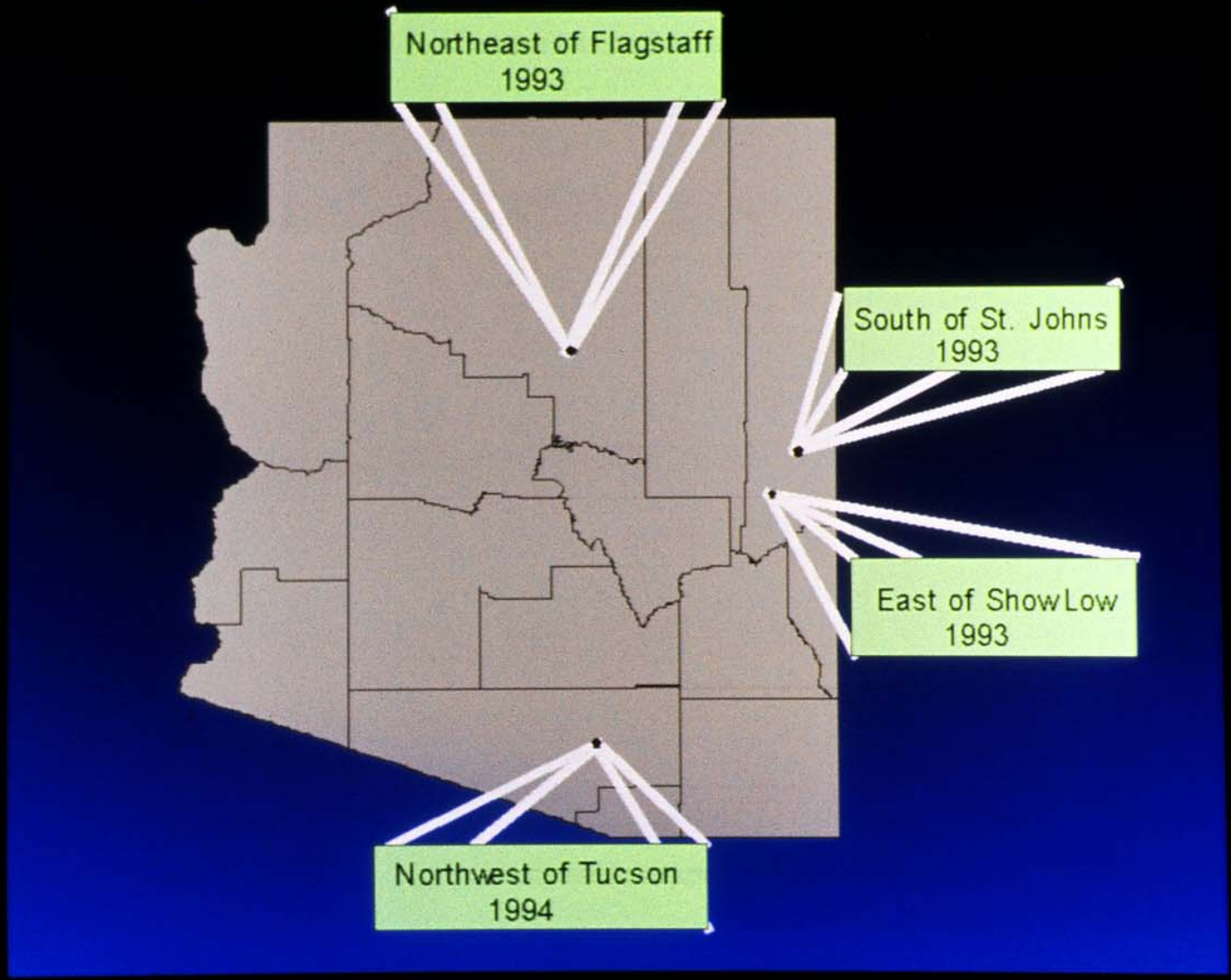
1993-1997 Arizona Hantavirus Retrap Study Sites



- Study identified "…a significant decrease in *Peromyscus* hantavirus antibody seroprevalence from the 1993–1994 outbreak trapping period to the 1996–1997 retrapping period ($X^2 = 43.59$, $P < 0.0001$)"

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Climatic and environmental patterns associated with hantavirus pulmonary syndrome, Four Corners region, United States

Engelthaler, Mosely, et al,

1999, Emerg Infect Dis

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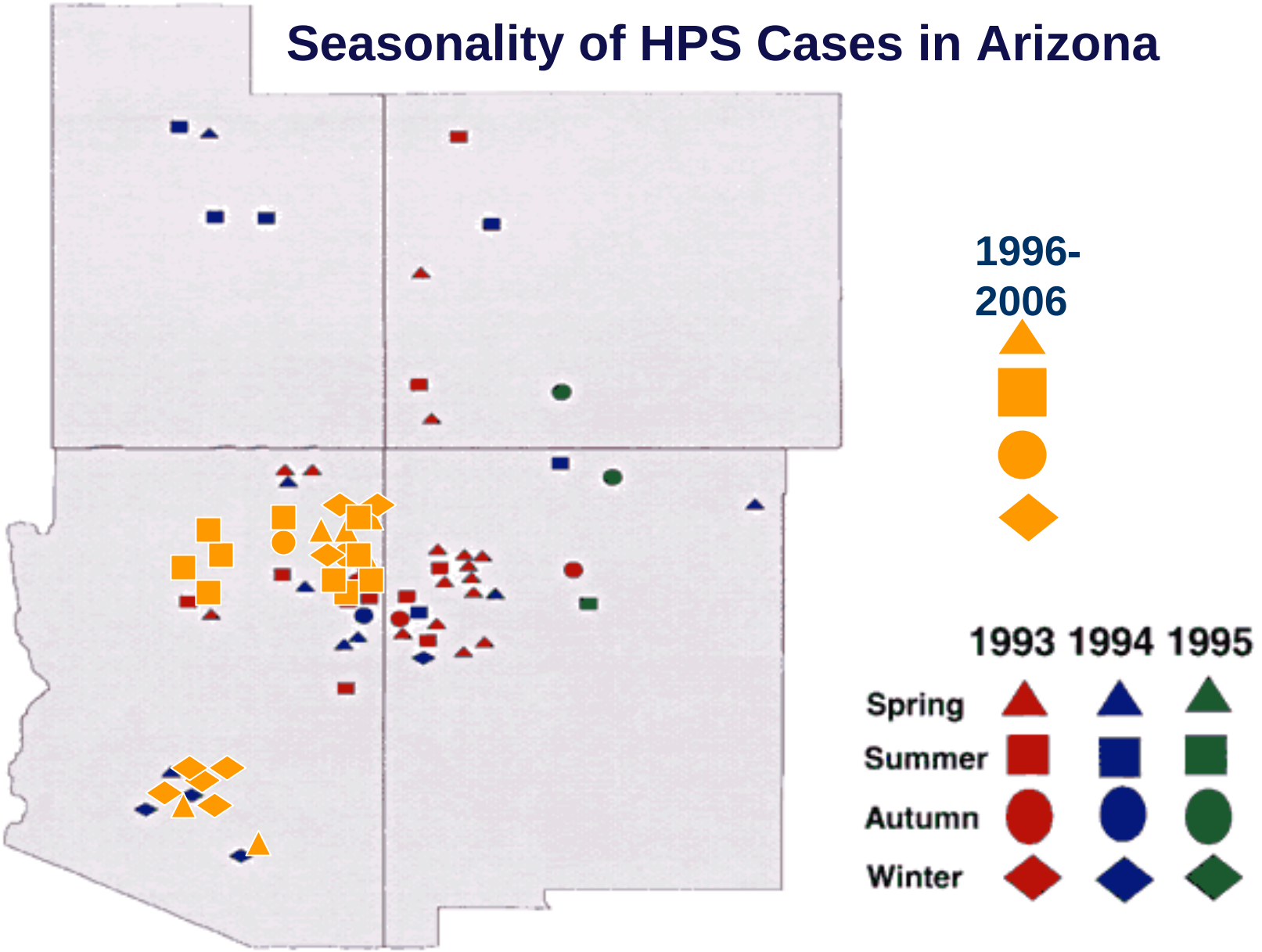
Seasonality of HPS Cases in Arizona



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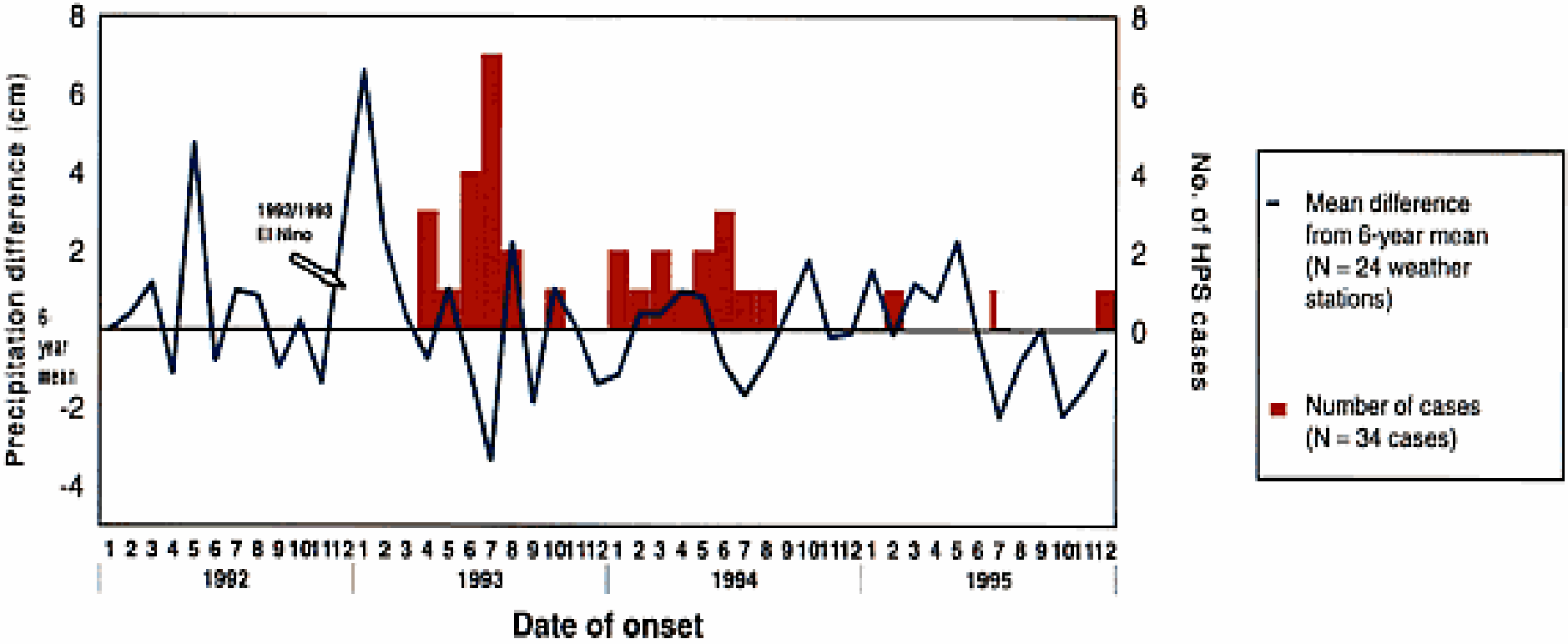
The Influence of Climate

HPS cases in Four Corners States and Precipitation, 1992-1995



From Engelthaler, Mosley et al, 1999, EID

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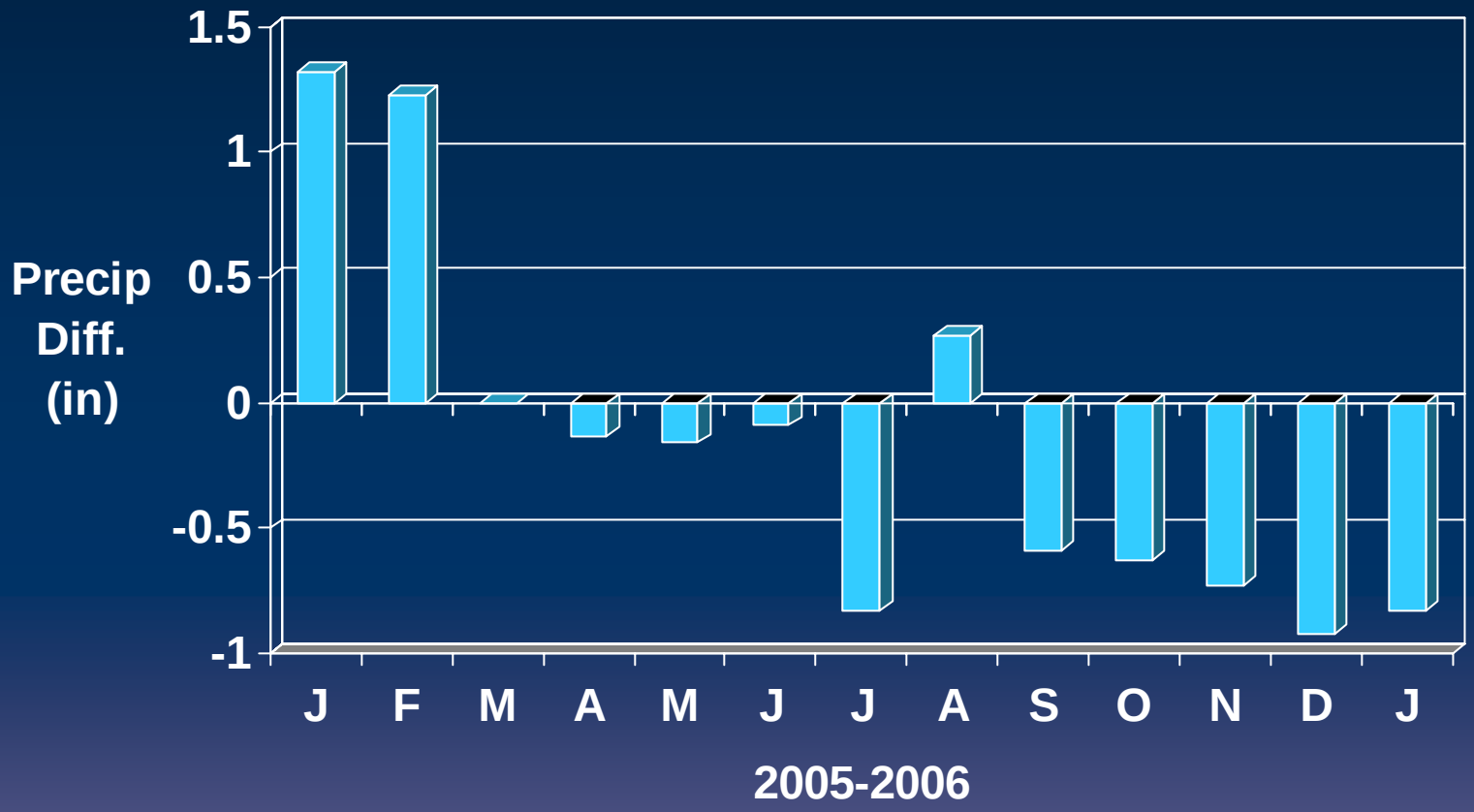
2005-2006 Precipitation Change from 30-yr mean

Phoenix



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2005-2006 Rainfall vs. 30 Year Mean

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Delayed Density Dependence

↑ Rainfall → ↑ Vegetation → ↑ Rodents →
→ ↑ Infected Rodents → ↔ % infected

followed by

↓ Rainfall → ↓ Rodents → ↑ % Infected
→ ↑ Risk to Humans

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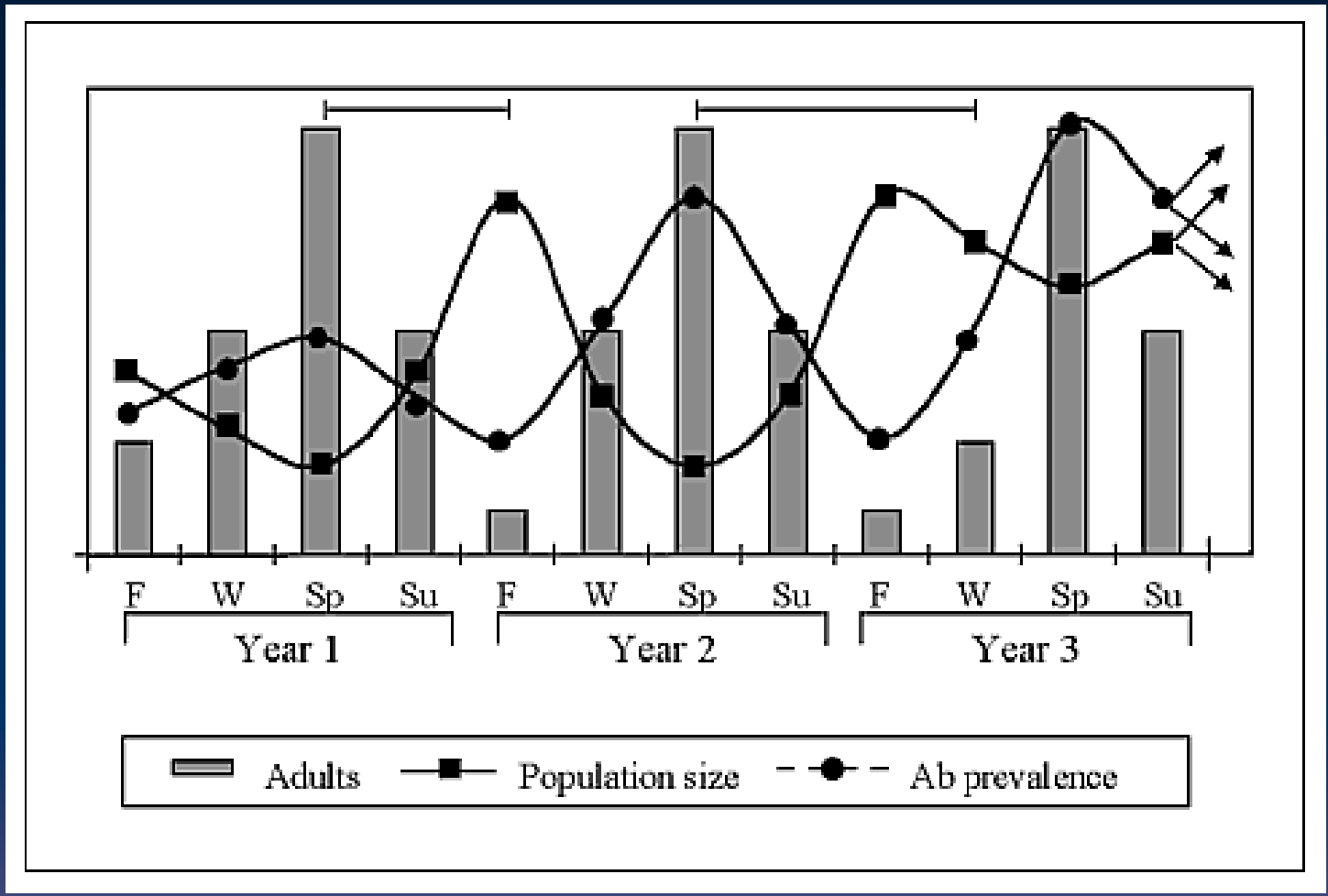
Delayed Density Dependence



Mills et al, 1999, EID

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Prevention and Control

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Prevention and Control

- No Vaccine
- No Treatment
- Behavioral Control
  - Reduce exposure to rodents, nests and droppings
  - Clear brush and clutter away from home
  - Close entryways into home
  - Trap out existing rodents
  - Use 10% Bleach or Lysol to wet down and disinfect

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Clear brush and clutter away from home

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Wet Disinfection

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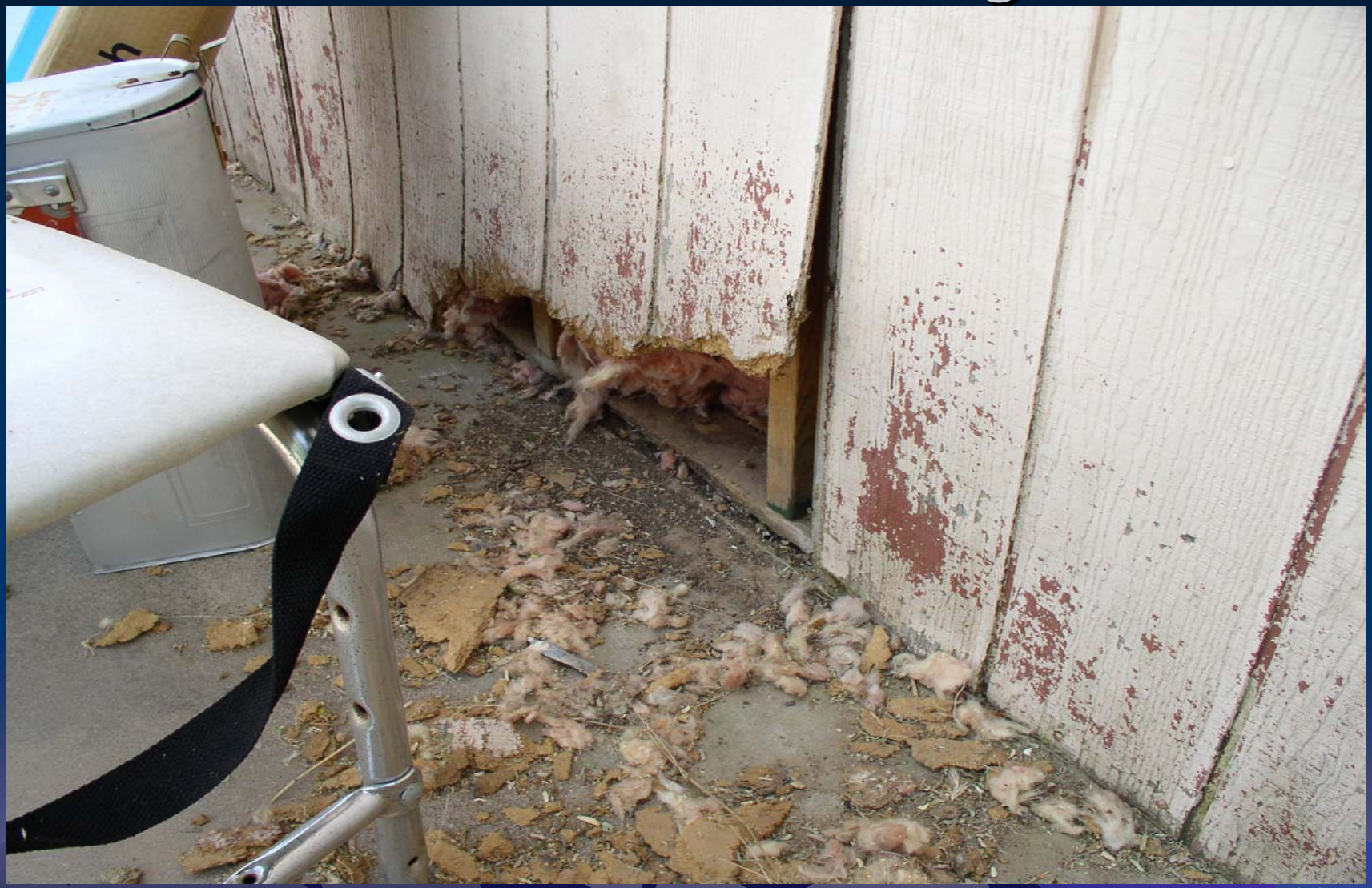
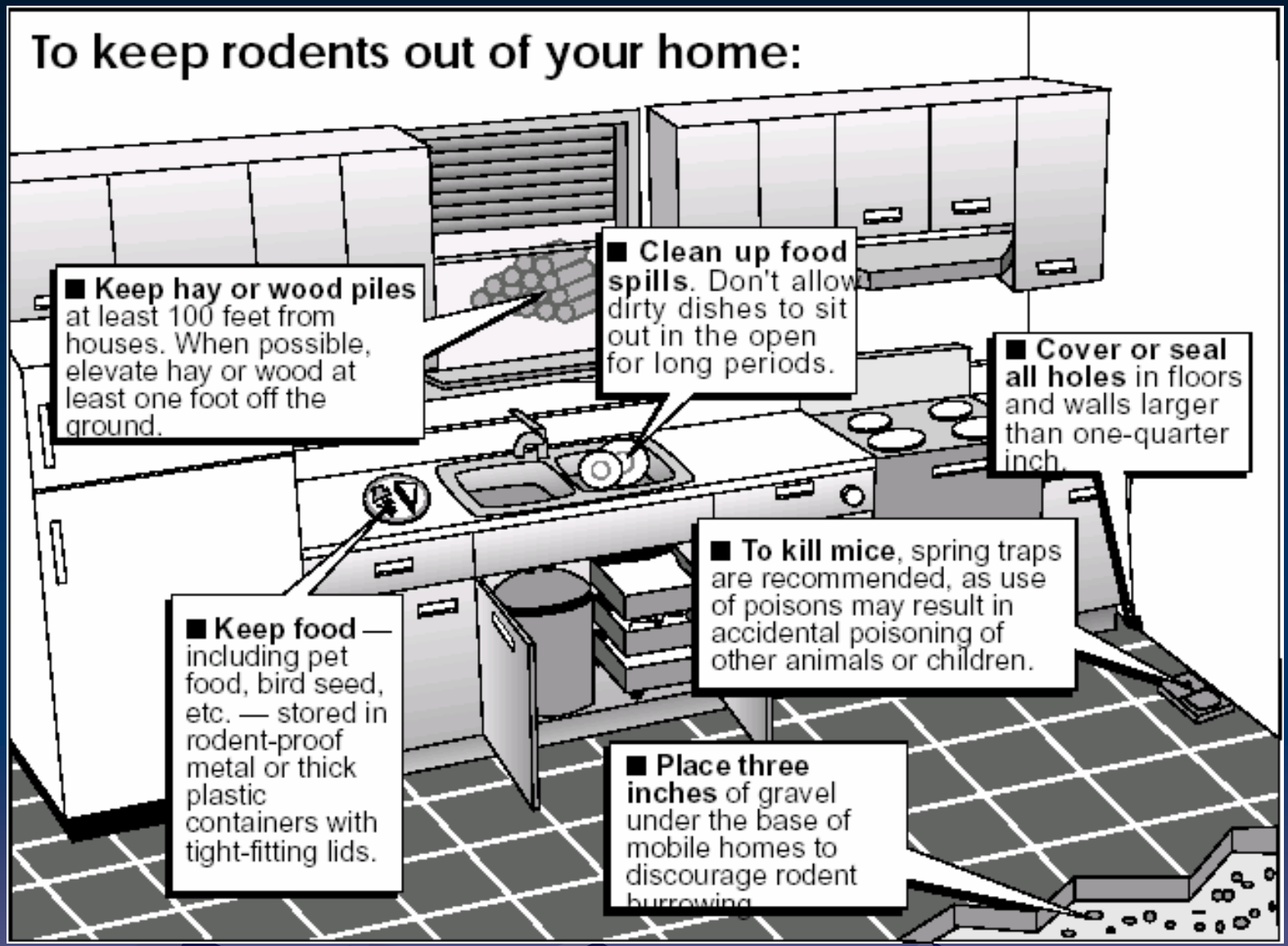
Rodent Proofing





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Before Control Measures

After Control Measures

Summary

- Sin Nombre virus is found throughout Arizona in deer mouse populations
- Biome and geography dictate seasonal risk of disease
- Climate and environment highly influence overall risk between years
- Prevention of disease can only occur through risk reduction behaviors

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Thank You!